

Patent Claims

1. Motor vehicle that is equipped with a movable convertible top (2), a control
5 equipment (5) for controlling a convertible top motion and a detection device (7)
for recognition of an intervention into the range of motion of a convertible top
mechanism (4), equipped with a sensor system (8, 38, 49) with sensors (9, 10, 14,
15, 22 - 25, 38) operating according to different measurement principles,
whereby, when recognizing a malfunction of the detection device (7) or in the
10 event of an obstruction situation, the convertible top motion is controlled in
safety mode (S9) during which the convertible top motion continues with reduced
speed and power or is stopped or reversed.
2. Motor vehicle according to claim 1, wherein a part of the sensors (9, 10, 14, 15)
15 represents an optical sensor system (8).
3. Motor vehicle according to claim 2, wherein the optical sensor system (8) is
designed with an optical light emitting and receiving device (14, 15), which
forms at least one light plane (16 - 21) around the range of motion of the
20 convertible top (2) and detects an intervention into the light plane with the aid of
a reflection detection medium.
4. Motor vehicle according to claim 3, wherein a laser is used as the light source of
the light emitting and receiving device (14, 15).
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5. Motor vehicle according to claims 3 or 4, wherein an electronic analysis unit is
provided, which uses the output signals of the reflection detection medium to
calculate the distance and/or the angle of an intervention into the light plane (16 -
21).
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6. Motor vehicle according to one of claims 3 through 5, wherein at least one light plane (19, 20, 21) is formed on a side of the convertible top mechanism (4) facing a passenger compartment (12).
- 5 7. Motor vehicle according to one of claims 3 through 6, wherein at least one light plane (16, 17, 18) is created on a side of the convertible top mechanism (4) facing the outside of the vehicle.
- 10 8. Motor vehicle according to one of claims 2 through 7, wherein the optical sensor system (8) is designed with at least one image sensor (9, 10), in particular a camera, which monitors the range of motion of the convertible top mechanism (4).
- 15 9. Motor vehicle according to claim 8, wherein an electronic analysis unit detects an intervention into the range of motion of the convertible top mechanism (4) by difference image analysis.
- 20 10. Motor vehicle according to claims 8 or 9, wherein at least one image sensor (9, 10) is also allocated to a device for monitoring the vehicle interior (12) and/or the position of occupants.
11. Motor vehicle according to one of claims 1 through 10, wherein the sensor system includes at least one capacitive sensor (22 - 25).
- 25 12. Motor vehicle according to claim 11, wherein an obstruction situation is detected when a selection of several capacitive sensors (22 - 25) is responding, in particular one sensor or two adjacent sensors.
- 30 13. Motor vehicle according to claims 11 or 12, wherein at least one capacitive sensor (22 - 25) that is used to recognize an obstruction situation is located in the

area of elements (26, 27) that are connected with hinges of a convertible top linkage and/or a tensioning bow (28) and/or a convertible top compartment cover (31) and/or a windshield frame (11) and/or an area (29) next to a window.

- 5 14. Motor vehicle according to one of claims 11 through 13, wherein the capacitive sensor (22 - 25) that is used to recognize an obstruction situation is located between a sealing section and/or a trim part and its support.
- 10 15. Motor vehicle according to one of claims 11 through 14, wherein the capacitive sensor (22 - 25) is designed like a film, whereby electrodes (32) are located on foil material.
- 15 16. Motor vehicle according to claim 15, wherein air is the dielectric of the capacitive sensor (22 - 25).
17. Motor vehicle according to one of claims 11 through 16, wherein the capacitive sensor (22 - 25) is connected to an automatically readjusting threshold switch (37).
- 20 18. Motor vehicle according to one of claims 1 through 17, wherein the sensor system includes at least one sensor (38) for detecting the power consumption of a top drive (6), which is connected to an electronic analysis unit, by means of which an obstruction situation can be detected by comparing the present current flow to a characteristic change in the current flow or to mathematically calculated
- 25 obstruction criteria.
19. Motor vehicle according to one of claims 2 through 18, wherein, safety mode (S9) is started when a fault is recognized in the optical sensor system (8).

20. Motor vehicle according to one of claims 1 through 19, wherein in normal mode (S3) after the sensor system was found to be functional a waiting time is started when an obstruction situation has been recognized and the convertible top motion is stopped and/or reversed; and the system checks during waiting time, whether
5 the obstruction situation is still present, whereby safety mode (9) is started if the result of the inquiry is positive.
21. Motor vehicle according to one of claims 1 through 20, wherein a processing function (S11) is started in safety mode (S9) for closing or opening the
10 convertible top (2) with reduced speed (v_{\min}), during which the system uses an inquiry function (S12) of an electronic analysis unit to check whether an obstruction situation is present, whereby a processing function (S13) that stops and/or reverses the convertible top motion is started if the result of the inquiry is positive.
22. Motor vehicle according to one of claims 1 through 21, wherein the reaction
15 whether to continue the convertible top movement with reduced speed (v_{\min}) or to stop or reverse the convertible top motion takes place in relationship to the obstruction that is being recognized.
23. Motor vehicle according to one of claims 1 through 22, wherein after an
20 automatic start (S1) of the convertible top movement an inquiry function for detecting a fault in the detection device (7) or for detecting an obstruction situation is started.
24. Motor vehicle according to one of claims 1 through 23, wherein a continuous
25 convertible top position recognition (39) is provided to monitor the position of the convertible top (2), which determines the position of a defined element (43, 44, 45) of the convertible top mechanism (4) using an acceleration sensor (40, 41,

42), which measures an actual acceleration in relationship to the acceleration of free fall.

- 5 25. Motor vehicle according to claim 24, wherein several acceleration sensors (40, 41, 42) are located on elements (43, 44, 45) of the convertible top mechanism (4) and connected to an electronic analysis unit (46), which uses the signals of the acceleration sensors (40, 41, 42) to calculate a relative position, which, together with the present information on the vehicle incline, results in the present convertible top position.
- 10 26. Motor vehicle according to one of claims 1 through 25, wherein the control equipment (5) for the control of the convertible top motion is equipped with a further acceleration sensor (48) that is used to detect the vehicle's inclination.
- 15 27. Motor vehicle according to one of claims 1 through 26, wherein the sensor system is part of a rain sensor.